

Authors

Jacqueline Kolove^a, Patrick Mapulanga^b, Ellen Chirwa^c

Corresponding Author

Patrick Mapulanga,
pmapulanga@kuhes.ac.mw

Affiliations

^aMinistry of Health, Blantyre District Health Office, Malawi.

^bLibrary Department, Kamuzu University of Health Sciences, Malawi.

^cDepartment of Reproductive Health, Kamuzu University of Health Sciences, Malawi.

Dates

Received: March 13, 2025

Accepted: April 26, 2026

Published: August 31, 2026

Abstract

BACKGROUND: Access to basic obstetric ultrasound scanning is essential for improving maternal and neonatal outcomes; however, it remains limited in low-resource settings. Integrating midwife-led ultrasound scanning into antenatal care (ANC) services enhance the early detection of complications and improve maternal health outcomes.

Aim: This study investigated the feasibility, acceptability, and impact of integrating midwife-led basic obstetric ultrasound scanning into routine antenatal care at the Ndirande Health Centre in Blantyre, Malawi.

Methods: This quality improvement project employed a phased approach to integrate basic obstetric ultrasound into antenatal care via sequential steps of training, piloting, mentorship, and full integration. A total of 7 Midwives underwent training in basic obstetric ultrasound techniques at Kamuzu University of Health Sciences (KUHS), selected based on their role as key providers at antenatal care. Routine scans were incorporated into antenatal visits over a six-month pilot period.

Results: Integration of midwife-led ultrasound scanning resulted in a 30% increase in ANC attendance. Pregnant women reported enhanced trust in antenatal services and greater confidence in pregnancy management. Midwives demonstrated a 95% accuracy rate in identifying foetal viability and position compared with obstetrician-confirmed results. However, challenges included technical difficulties with the equipment and initial resistance due to unfamiliarity with the intervention.

Conclusion: Midwife-led basic obstet-

ric ultrasound scanning is a feasible and acceptable intervention that improves ANC utilisation and maternal satisfaction in low-resource settings. Addressing technical and training challenges will be critical for broader implementation and sustainability.

Keywords

Midwife-led ultrasound, antenatal care, obstetric ultrasound, maternal health, resource-limited settings, pregnancy outcomes, health service integration.

Introduction

Prenatal care, particularly incorporating basic obstetric ultrasound imaging, plays a crucial role in the timely detection and management of potentially life-threatening conditions in both the mother and the foetus (Tefera et al., 2024). The World Health Organization (WHO) recommends early ultrasound scanning of pregnant women during their initial visits to identify potential abnormalities (WHO, 2022). Similarly, the New Antenatal Guidelines for Malawi advocate early ultrasound imaging at 24 weeks of gestation to assess gestational age, identify foetal anomalies, and detect multiple pregnancies, aiming to enhance the overall maternal pregnancy experience (Ministry of Health, 2019).

Midwife-led ultrasound scanning in Malawi has been introduced as a task-sharing innovation to address gaps in obstetric imaging within resource-constrained health systems (Abawollo et al., 2022). Evidence from implementation studies demonstrates that midwives, when trained in focused obstetric ultrasound protocols, can reliably perform key assessments including gestational age estimation, fetal viability, presentation, and placental location (A. C. Viner et al., 2022). These competencies improve the accuracy of pregnancy dating compared to last menstrual period alone, facilitate earlier identification of complications such as multiple gestation or mal presentation, and enhance the completeness of antenatal documentation (Swanson et al., 2019). Integration of ultrasound

into routine antenatal care by midwives has been shown to be feasible and acceptable to both providers and clients, with reported improvements in community trust and service utilization (A. Viner et al., 2022). However, challenges remain in relation to equipment availability and maintenance, quality assurance mechanisms, and balancing ultrasound duties with routine clinical responsibilities (Wanyonyi et al., 2017).

Malawi's healthcare system is structured in three levels; primary health centers and community clinics, secondary district hospitals, and tertiary referral hospitals. Blantyre District is unique in lacking its own district hospital, which places additional strain on Queen Elizabeth Central Hospital (QECH), the country's largest tertiary facility and teaching hospital. Ndirande Health Centre, one of the busiest primary care facilities in Blantyre, functions as a key feeder institution to QECH, referring complicated cases and patients requiring advanced diagnostics or specialist care. Because Blantyre has no district hospital to bridge the gap between primary care and tertiary services, QECH often absorbs a dual role, serving both as a referral center for complex cases and as a district hospital for routine emergencies, with Ndirande and other health centers relying heavily on its services.

Access to basic obstetric ultrasound services often necessitates referrals to facilities such as the QECH to ascertain factors such as multiple gestations, foetal viability, gestational age, and presentation. An average of 20 women per month were referred from Ndirande Health Centre to QECH for obstetric scanning. This influx has contributed to congestion at QECH, which already handles a large number of patients from various districts. Consequently, these women faced significant challenges, including prolonged waiting times, owing to the large number of patients awaiting obstetric ultrasound scanning. To avoid these delays, some women seek services from private clinics, which incur additional costs that many cannot afford. This situation underscores the need for improved efficiency and accessibility of ultrasound scanning at Ndirande Health Centre to ensure timely and affordable obstetric care for all women.

Ndirande Health Centre, a prominent government-owned urban health facility in the Blantyre District, Malawi, serves a substantial catchment population exceeding 145,187 individuals, including approximately 62,500 women of childbearing age. Annually, over 3,000 initial pregnant women receive antenatal care at this facility (Edition, 2023). The staff at the facility comprised 11 clin-

ical officers, two registered nurse midwives, three Registered Nurses, and 25 nurse midwife technicians. The clinic operates prenatal services on weekdays, with a considerable workload of 120 prenatal appointments and 55 initial antenatal appointments every week. To optimise efficiency and quality of care, the clinic assigned two midwives daily to conduct the routine antenatal care. However, the nurse-patient ratio currently stands at 1:2,083, which falls significantly below the WHO-recommended ratio of 1:1000 (Muller et al., 2021).

Integration of USS into antenatal services enhanced the accessibility and quality of antenatal care by empowering midwives with skills to perform essential ultrasound scans. This not only improved early detection and management of potential complications but also ensured timely and personalised care for expectant mothers. The purpose of the quality improvement project was to integrate midwife-led basic obstetric ultrasound scanning into antenatal services at Ndirande Health Centre. In this paper, we share our experiences of the step-by-step process of integrating midwifery-led ultrasound scanning into antenatal services, and discuss the enablers and challenges of integrating obstetric ultrasound scanning into antenatal care services.

Study aims: This study investigated the feasibility, acceptability, and impact of integrating midwife-led basic obstetric ultrasound scanning into routine antenatal care at the Ndirande Health Center in Blantyre, Malawi.

Methods

Study Design: This quality improvement project employed a phased approach to integrate basic obstetric ultrasound scanning into antenatal care. The process consisted of four key steps: (1) training healthcare providers, (2) introducing ultrasound services to a pilot group of clients, (3) providing supportive mentorship, and (4) fully integrating ultrasound services into routine antenatal care. Each phase was carefully planned and executed to ensure sustainability and capacity building among the healthcare providers. Quantitative data were obtained from antenatal clinic records to assess changes in ANC utilisation and maternal health outcomes before and after the integration of USS into antenatal services.

Training of health care providers: The comprehensive training program provided by KUHES addressed critical competencies such as foetal presentation determination, gestational age assessment, and early detection of pregnancy complications. KUHES provided ongoing training and refresher courses for seven midwives selected based on their

role as key providers of antenatal care for a 7day theory and 7 day practical trainings followed by a 6 months supportive mentorship to ensure that midwives stay updated on best practices and new developments in obstetric ultrasound. The key content areas covered were the identification of the presentation of a foetus, identification and monitoring of the foetal condition, understanding of the position and orientation of the foetus, placental localisation, amniotic Fluid Adequacy, and estimation of foetal age.

Scheduling health care providers: The midwives scheduled ultrasound scanning at the antenatal clinic. This ensured that one midwife focused on ultrasound scanning, whereas the other handled different aspects of antenatal care. This included scanning women with indications such as confirming gestation, confirming presentation, confirming placental location, and confirming the viability of the foetus only.

Supportive mentorship: The supportive mentorship provided by the KUHES faculty facilitated ongoing learning and guidance, while peer mentorship encouraged knowledge exchange and collaboration.

Ethics approval: Institutional Review Board Statement: Ethics Approval was waived by the College of Medicine Ethics and Review Board (COMREC), as it felt that this was a quality improvement study.

Review Findings

The integration of midwife-led basic obstetric ultrasound scanning into antenatal services: This section provides a critical overview of the findings on the integration of midwife-led basic obstetric ultrasound scanning with antenatal services at the Ndirande Health Centre in Blantyre, Malawi. This highlights several key findings regarding pregnancy outcomes and complications identified using ultrasound screening.

Full integration of basic obstetric ultrasound scanning into antenatal care services: Healthcare providers were scheduled to optimise efficiency and quality of care, and the clinic assigned two midwives on a daily basis to manage the antenatal clinic. This was followed by scanning all pregnant women seeking initial antenatal care to detect abnormalities at an early stage, as follows:

Figure 1: Number of Initial mothers versus Total scanned from August 2023 to December 2023

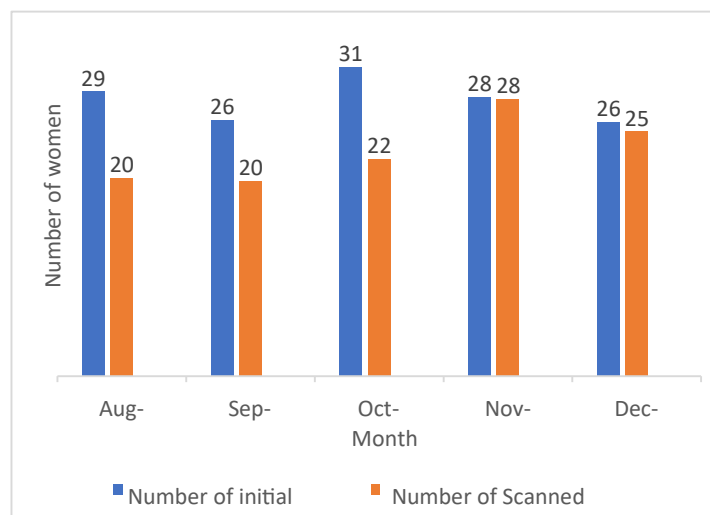
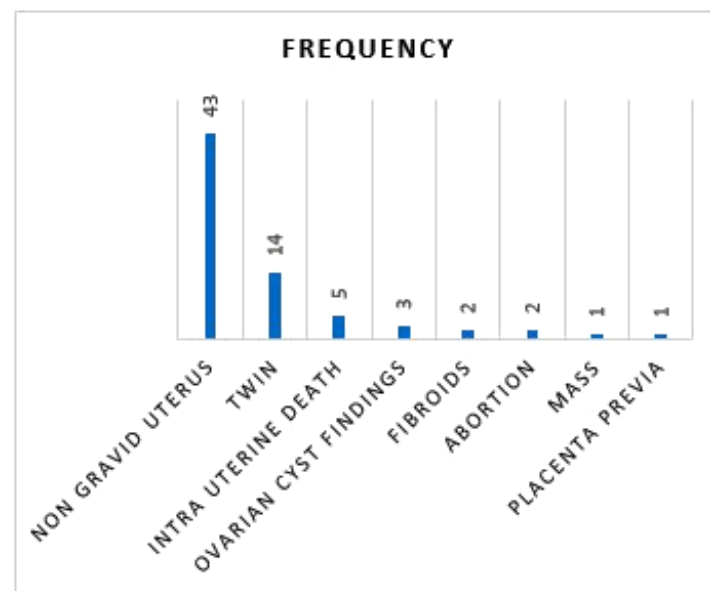


Figure 2: Outcomes observed after scanning from August 2023 to December 2023.



Key insights of ultrasound scans conducted from August 2023—June 2024:

Total Scanning Rate: Most months have a high scanning rate, with some months exceeding 100% of recorded initial visits (possibly due to repeat scans or walk-in cases).

First Trimester Scans: February 2024 recorded the highest percentage of first-trimester scans (23.7%), while September 2023 had the lowest (9.0%).

Table 1: Summary of Ultrasound Scans Conducted (August 2023 – June 2024)

Month	Total Initial Visits	Total Scanned	First Trimester Scan	Confirm Gestational Age	Confirm Viability	Confirm Presentation
Aug 2023	292	203	24 (11.8%)	198 (97.5%)	3 (1.5%)	2 (1.0%)
Sept 2023	263	200	18 (9.0%)	190 (95.0%)	5 (2.5%)	5 (2.5%)
Oct 2023	317	223	26 (11.7%)	217 (97.3%)	2 (0.9%)	4 (1.8%)
Nov 2023	286	284	24 (8.5%)	253 (89.1%)	3 (1.1%)	3 (1.1%)
Dec 2023	261	251	29 (11.6%)	235 (93.6%)	4 (1.6%)	5 (2.0%)
Jan 2024	290	284	28 (9.9%)	166 (58.5%)	2 (0.7%)	3 (1.1%)
Feb 2024	337	287	68 (23.7%)	337 (100.0%)	3 (1.0%)	5 (1.7%)
Mar 2024	253	253	39 (15.4%)	233 (92.1%)	3 (1.2%)	7 (2.8%)
April 2024	290	233	33 (14.2%)	251 (107.7%)*	3 (1.3%)	5 (2.1%)
May 2024	282	251	33 (13.1%)	248 (98.8%)	11 (4.4%)	8 (3.2%)
June 2024	260	250	32 (12.8%)	251 (100.4%)*	5 (2.0%)	11 (4.4%)

Gestational Age Confirmation: Consistently high across all months except January 2024, where only 58.5% of scanned cases had gestational age confirmed.

Viability Confirmation: A small percentage of cases needed confirmation of viability, ranging from 0.7% to 4.4%.

Presentation Confirmation: Generally low but increased in June 2024 (4.4%).

Enablers and Challenges to integrating midwife-led basic obstetric ultrasound scanning into antenatal services

Enablers: Several facilitative factors have contributed to the successful integration of ultrasound scanning with antenatal services at the Ndirande Health Centre.

Comprehensive training: The provision of comprehensive training programs by KUHES played a pivotal role in enhancing midwives' proficiency in basic ultrasound scanning techniques. These educational endeavours empowered midwives with the requisite skills and competencies to conduct ultrasound examinations proficiently, thereby bolstering the diagnostic capabilities of the clinic.

Provision of ultrasound supplies: The consistent provision of ultrasound supplies, including gel, stationary, and ancillary items, by KUHES ensured the uninterrupted functionality of ultrasound machines at the Ndirande Health Centre. This sustained logistical support facilitates

seamless operational continuity, enabling healthcare practitioners to conduct diagnostic procedures without impediments (Swanson et al., 2017).

Good collaboration between midwives and sonographers:

The culture of collaboration between midwives and experienced ultrasonography professionals fostered a conducive learning environment in which knowledge exchange and skill enhancement thrive. Regular professional consultations and training sessions facilitated by seasoned experts bolstered midwives' understanding and confidence in interpreting ultrasound images, thereby enhancing diagnostic accuracy and efficacy.

Midwives proactively incorporated ultrasound scanning into their regular health-teaching endeavours. This fostered patient cooperation and engagement, thereby facilitating informed decision making and proactive healthcare-seeking behaviours among pregnant women.

Commitment and team work: Effective teamwork among midwives, obstetricians, and other health care professionals has fostered a collaborative environment. This ensured that any complications detected during the scans were promptly addressed with inputs from various experts.

Teamwork allowed for the distribution of tasks, ensuring that midwives could focus on ultrasound scanning, while other team members handled different aspects of antenatal care. This improves the efficiency and quality of care provided.

Leadership: The presence of a good leader possessed a clear vision, inspiring and motivating others towards a future where midwives played a key role in providing comprehensive antenatal care. The leader understands and addresses the concerns of midwives, patients, and stakeholders through empathy and fostering trust and support. Effective communication ensures that everyone involved comprehends the goals, processes, and benefits of the integration. Additionally, the leader promoted collaboration among healthcare professionals, encouraging teamwork to facilitate smooth implementation of new services.

Challenges to integrating midwife-led basic obstetric ultrasound scanning into antenatal services: The implementation of ultrasound scanning within the antenatal service at Ndirande Health Centre is affected by several challenges. The operational efficacy of ultrasound scanning sessions is frequently compromised by recurrent power outages, which result in workflow interruptions and incomplete scans. These disruptions impede timely delivery of diagnostic services.

Transfer of midwives: The intermittent transfer of midwives, particularly those with specialised training in ultrasound scanning, poses a significant challenge to the continuity and consistency of prenatal care. The departure of experienced personnel diminishes the pool of proficient practitioners, exacerbates skill shortages, and potentially compromises the quality of ultrasound-based diagnostics.

Cultural, socioeconomic, and interpersonal barriers: Cultural, socioeconomic, and interpersonal barriers impede timely antenatal care engagement among pregnant women, with many deferring clinic visits until the second or third trimester. This delay, exacerbated by factors such as lack of partner support and apprehension towards healthcare providers, hampers early anomaly detection and limits the window for intervention, thereby increasing maternal and foetal health risks.

The limited availability of ultrasound equipment: The limited availability of ultrasound equipment, with only one machine and accessible prolonged scanning wait times. This insufficiency impedes the seamless integration of ultrasound-based diagnostics into prenatal care protocols, restricting the capacity of clinics to accommodate patient volumes and deliver timely diagnostic services. The scarcity of structured training initiatives for midwives, particularly ultrasound scanning, has under-

mined the successful implementation of prenatal care enhancement projects.

Discussion of the findings

First, the high percentage (93.9%) of normal pregnancies among clients undergoing antenatal scanning is encouraging. This underscores the importance of routine examinations for reproductive health and early pregnancy screening, contributing to improved prenatal care and maternal-foetal health outcomes (Roro et al., 2022).

The identification of non-gravid uteri (3.7%) among clients is notable, as it may indicate various conditions such as infertility, miscarriage, or pregnancies that are too small to be detected by scanning. This finding underscores the complexity of reproductive health and the need for thorough examination and evaluation during antenatal care (WHO, 2016). The prevalence of twin gestations (1.2%) within the cohort highlights the importance of the early detection and management of multiple pregnancies to optimise maternal and foetal outcomes.

The discovery of intrauterine death (0.4%) raises concerns and warrants further investigation of its potential causes, including maternal health disorders, placental problems, and genetic abnormalities. This finding underscores the importance of close monitoring and timely intervention for high-risk pregnancies. Similarly, the detection of ovarian cysts (0.3%) and fibroids (0.2%) underscores the need for careful evaluation of such conditions during pregnancy, as they may impact pregnancy progression and require intervention to ensure optimal outcomes for both the mother and foetus (Bascietto et al., 2017).

The identification of abortions with retained products of conception (0.2%) and placenta previa (0.1%) highlights the challenges that some women may face in sustaining a successful pregnancy, and the importance of timely management and referral to specialised care centres for appropriate treatment (Wachira et al., 2023).

Overall, these findings provide valuable insights into the spectrum of prenatal illnesses and complications experienced by the patients. They emphasised the importance of comprehensive prenatal care, close observation, and timely intervention to optimise maternal and neonatal health outcomes. Additionally, the data generated from this project can inform healthcare practices, policy changes, and future research to improve maternal and neonatal health outcomes in resource-limited settings.

Implications and Recommendations

Based on the findings and implications of this quality improvement project, the following recommendations are proposed to enhance the efficacy and accessibility of prenatal care services at Ndirande Health Centre.

Given the susceptibility of antenatal clinic operations to disruptions caused by power outages, it is advisable to procure and install dependable solar-backup power sources. This strategic investment ensures the uninterrupted functionality of ultrasound machines, thereby mitigating the risk of service interruptions and safeguarding the continuity of prenatal diagnostic capabilities during periods of power instability.

To mitigate the adverse effects of employee turnover and preserve institutional knowledge, institutions should organise structured mentorship programmes. These programs would facilitate the transfer of expertise from seasoned midwives to newly recruited personnel, fostering continuous professional development and ensuring the preservation of best practices in prenatal care service delivery.

Recognising the pivotal role of community engagement in promoting maternal and foetal health outcomes, concerted efforts should be directed towards organising targeted campaigns aimed at raising awareness among expectant mothers regarding the benefits of ultrasound screening and the importance of initiating prenatal care early. By disseminating accurate information and dispelling misconceptions, these campaigns can empower expectant mothers to make informed decisions regarding their antenatal healthcare-seeking behaviours, thereby fostering a culture of proactive maternal health management within the community.

Conclusion

The integration of ultrasound scanning at the Ndirande Health Centre serves as a critical asset in antenatal care, providing crucial interventions for the health status of both expectant mothers and fetuses. The data generated through scanning not only facilitates the early detection of potential complications but also enables healthcare practitioners to promptly intervene and administer appropriate medical interventions, thereby contributing significantly to the overarching goal of enhancing maternal and neonatal health outcomes.

Acknowledgments

We would like to express our sincere gratitude to all the

participants in this study. Their openness and willingness to share their experiences were invaluable for our research. Without their contribution, this study would not have been possible.

Author Contributions

All authors contributed equally to this work. Conceptualisation, methodology, software, validation, formal analysis, investigation, resources, data curation, writing – original draft preparation was done by Jacqueline Kolove. Writing – review and editing, supervision and project administration were carried out by Patrick Mapulanga and Ellen Chirwa. All the authors have read and agreed to the published version of the manuscript.

Conflicts of Interest

The authors declare that they have no conflicts of interest.

Data Availability Statement

The data presented in this study are available upon reasonable request from the corresponding authors. Owing to privacy and ethical restrictions, the data are not publicly accessible. Access will be provided in a manner that ensures the confidentiality of participants and complies with ethical guidelines.

Guidelines and Standards Statement

This manuscript was drafted against the COREQ (Consolidated Criteria for Reporting Qualitative Research) guidelines for qualitative research.

References

- Abawollo, H.S. et al. (2022) 'Contribution of portable obstetric ultrasound service innovation in averting maternal and neonatal morbidities and mortalities at semi-urban health centers of Ethiopia: a retrospective facility-based study', *BMC Pregnancy and Childbirth*, 22(1), pp. 1–9. Available at: <https://doi.org/10.1186/s12884-022-04703-1>.
- Bascietto, F. et al. (2017) 'Outcome of fetal ovarian cysts diagnosed on prenatal ultrasound examination: systematic review and meta-analysis', *Ultrasound in Obstetrics and Gynecology*, 50(1), pp. 20–31. Available at: <https://doi.org/10.1002/uog.16002>.
- Edition, F. (2023) 'Government of the Republic of Malawi Health Sector Strategic Plan III'.
- Ministry of Health (2019) 'Malawi National Reproductive Health Service Delivery Guidelines Malawi National Reproductive Health Service Delivery Guidelines'.

Muller, A. et al. (2021) 'In order to protect our mothers, we need to prioritize our nurses and midwives', *International Journal of Africa Nursing Sciences*, 15, p. 100383. Available at: <https://doi.org/10.1016/j.ijans.2021.100383>.

Roro, M.A. et al. (2022) 'Enablers and barriers to introduction of obstetrics ultrasound service at primary care facilities in a resource-limited setting: a qualitative study in four regions of Ethiopia', *BMC Pregnancy and Childbirth*, 22(1), pp. 1–9. Available at: <https://doi.org/10.1186/s12884-022-04609-y>.

Swanson, D. et al. (2017) 'Challenges of implementing antenatal ultrasound screening in a rural study site: A case study from the democratic republic of the congo', *Global Health Science and Practice*, 5(2), pp. 315–324. Available at: <https://doi.org/10.9745/GHSP-D-16-00191>.

Swanson, D.L. et al. (2019) 'Including ultrasound scans in antenatal care in low-resource settings: Considering the complementarity of obstetric ultrasound screening and maternity waiting homes in strengthening referral systems in low-resource, rural settings', *Seminars in Perinatology*, 43(5), pp. 273–281. Available at: <https://doi.org/10.1053/j.semperi.2019.03.017>.

Tefera, M. et al. (2024) 'Health professionals' perspectives on the role of obstetric ultrasonography in maternity care in rural eastern Ethiopia: a qualitative descriptive study', *BMJ open*, 14(4), p. e075263. Available at: <https://doi.org/10.1136/bmjopen-2023-075263>.

Viner, A. et al. (2022) 'Midwife-Led Ultrasound Scanning to Date Pregnancy in Malawi: Development of a Novel Training Program', *Journal of Midwifery and Women's Health*, 67(6), pp. 728–734. Available at: <https://doi.org/10.1111/jmwh.13442>.

Viner, A.C. et al. (2022) 'Training in Ultrasound to Determine Gestational Age (TUDA): Evaluation of a Novel Education Package to Teach Ultrasound-Naive Midwives Basic Obstetric Ultrasound in Malawi', *Frontiers in Global Women's Health*, 3(April), pp. 1–10. Available at: <https://doi.org/10.3389/fgwh.2022.880615>.

Wachira, J. et al. (2023) 'A training program for obstetrics point-of-care ultrasound to 514 rural healthcare providers in Kenya', *BMC Medical Education*, 23(1), pp. 1–8. Available at: <https://doi.org/10.1186/s12909-023-04886-x>.

Wanyonyi, S.Z. et al. (2017) 'Opportunities and Challenges in Realizing Universal Access to Obstetric Ultrasound in Sub-Saharan Africa', *Ultrasound International Open*, 3(2), pp. E52–E59. Available at: <https://doi.org/10.1055/s-0043-103948>.

WHO (2016) 'WHO Antenatal Care Guidelines', WHO Press, (March), pp. 1–6.

WHO (2022) WHO antenatal care recommendations for a positive pregnancy experience maternal and fetal assessment update : imaging ultrasound before 24 weeks of pregnancy. Available at: https://www.ncbi.nlm.nih.gov/books/NBK579604/pdf/Bookshelf_NBK579604.pdf.